towards the north-east. The anticlinal fault of Charnwood Forest, so far as known, satisfies these conditions, and it is highly probable that the earthquake was caused by a slip of this fault.

The beginning of the sound preceded that of the shock in all parts of the disturbed area; the end of the sound followed that of the shock in the central district and in the neighbourhood of the minor axis, but preceded it near the end of the major axis. Thus the sound apparently outraced the shock in the direction of the major axis, but not in that of the minor axis. These time-relations of the sound and shock can be readily explained if the area over which the fault-slip took place were several miles in length, for the sound in all probability is due to small and rapid vibrations proceeding chiefly from the margins of that area.

The intensity was greatest at and near Woodhouse Eaves, and it is probable that the fault-slip began in the neighbourhood of this place, gradually diminishing in amount in either direction, rather rapidly towards the north-west, and much more slowly towards the south-east; the rate at which the slipping advanced being greater than the velocity of the earth-wave. The total length of the fault-slip may have been as much as 12 miles or even more, and there can be little doubt that it was continued for some distance under the Triassic rocks on which Leicester is built.

V. "The Total Solar Eclipse of 16th April, 1893. Report on Results obtained with the Slit Spectroscopes." By E. H. Hills, Capt. R.E. Communicated by the Joint Solar Eclipse Committee. Received March 7, 1894.

The parties in Brazil and Africa were both supplied with these instruments, two being sent to each station. The instruments were arranged to take one photograph only during the eclipse with an exposure as long as possible. It was considered that the amount of light available would not allow of more than one successful exposure being made. Of the four resulting photographs, one of those taken in Brazil was unfortunately not finished before the sun reappeared, whilst the other shows a faint corona spectrum with a strong sky spectrum on both sides, and a considerable amount of general fog over the plate.

I have been able to detect nothing of interest in this photograph, for the Fraunhofer lines overlap the corona spectrum to such a degree that it is impossible to distinguish any bright lines with certainty.

The instrument employed in Africa consisted of two spectroscopes, on one equatorial mounting. The first spectroscope had two prisms,

each 1·75 in. height and 2·5 in. in base, with refracting angles of 62°, and the second spectroscope had one prism 2·6 in. both in height and base.

Condensing lenses, 3·5 in. aperture and 17·5 in. focus, and of 3 in. aperture and 14·5 in. focus, were used with the two instruments respectively.

Both spectroscopes were fixed on stout mahogany base-boards, and were completely adjusted before leaving England.

To attach them to the mounting, a mahogany tube, about 6 in. square and 2 ft. long, was bolted to the top of the declination axis, and the base-boards of the spectroscopes were screwed on either side of it.

A small telescope of $2\frac{1}{2}$ in. aperture was attached on the other side of the tube to act as a finder and for purposes of adjustment. The mounting was one that was made for the eclipse of 1886. It consisted of a tripod stand composed of pieces of angle iron with the polar and declination axes, and circles of the Corbett equatorial. It was found to be easy to set up and rigid.

On arrival at Fundium, a site was selected, and a concrete base was formed. On this the instrument was set up, and no trouble was experienced in getting it into adjustment. The slits of the two spectroscopes were placed parallel to each other and tangential to a circle of declination, and were adjusted so that they cut across opposite limbs of the sun, that of the two-prism spectroscope being across the upper or western limb, and that of the one-prism spectroscope across the eastern limb. For several days before the eclipse, trial plates were taken, in order to obtain reference spectra, and for getting the focus as perfect as possible, as well as for the sake of practising the development of the plates.

The plates used were Cadett's most rapid make, and various developers were tried, but no special peculiarities of behaviour were noticed; pyrogallic acid was used for the eclipse plates. Before leaving England the plates were backed with a solution of asphalt in benzole, for the purpose of destroying the halation or reflection from the back surface of the glass.

At the eclipse the shutters of the two cameras were opened about ten seconds after the commencement of totality, and closed about ten seconds before the end, giving a total exposure of three minutes fifty seconds. During the progress of the eclipse I observed the corona and the upper or western limb of the sun through the small telescope with a magnifying power of 40. The corona in this region showed very faint radial markings and several rosy-pink prominences were seen. The largest of these was one at the W.N.W. limb, which is the one of which a strong spectrum was obtained with the two-prism spectroscope. The plates were developed the same evening on

board the "Alecto." The resulting photograph in the case of the two-prism spectroscope shows a prominence spectrum on both sides of the dark body of the moon, and outside these a corona spectrum with a faint solar (dark line) spectrum on its extreme edge. The H, K and some other lines extend over the dark moon and on both sides beyond the limits of the corona spectrum. That of the one-prism spectroscope shows the same general character, but there is a prominence spectrum on one side only. Both these photographs were over-exposed, better results would have been obtained if two or even three exposures had been made in the same time.

Measurement of the Photographs.

The following is the method of measurement adopted. A very accurate micrometer by Hilger, reading to 0·001 mm., was employed throughout.

The large number of bright lines in the prominence spectrum rendered the use of the reference spectra unnecessary.

The hydrogen series, together with the lines at wave-lengths 4215·3, 4471·2, and the *b* group gave a sufficient number of fixed points through which to draw an interpolation curve. The micrometer readings of these lines having been taken with the greatest possible accuracy, an interpolation curve was constructed on a large scale, two curves being drawn for each photograph as a check on each other. The micrometer readings of the remaining prominence lines were then determined and their wave-lengths taken from the curves.

The micrometer readings of the corona lines were next taken. It was impossible to get both sides of the photograph in the field of the microscope at the same time, so each side was taken separately, thus getting four series of scale-readings representing possible coronal lines.

The wave-lengths corresponding to these scale-readings were then determined from the interpolation curves, and lists were made—first, of lines common to both photographs; second, of lines occurring on both sides of one photograph; third, of lines which had been observed in previous eclipses.

New measurements of the photographs were again made, with the same care as the first, and all lines in the lists were struck out which were not plainly visible in this second scrutiny.

It is possible that this final list may contain some wave-lengths of lines due to accidental marks; this must be rare, however, as any mark so treated must have been parallel to the lines.

A comparison of the measurements of the two photographs will give a good idea of the limits of accuracy of these results.

The Prominence Spectrum.

This list gives the wave-lengths of all the lines in one prominence from each photograph. The second prominence on the two-prism spectroscope plate is of a similar character to the one given, but contains fewer lines.

The intensities of the lines are given approximately by the numbers from 1 to 6.

The most interesting feature of this spectrum is the extended hydrogen series. There seems no reason to doubt that the lines at wave-lengths 3692·5, 3687, 3682, 3678, 3675, 3672, 3669·5, and 3667 are members of it.

M. Deslandres has obtained a photograph showing five hydrogen lines beyond the one at wave-length 3699 ; this photograph carries the series three lines further. The line at 3680 is the iron line, whose wave-length is given by Cornu as 3680·3, and by Hartley as 3679·5. The new notation for the hydrogen series has been used as convenient. $H\beta$ is F, $H\gamma$ the line near G, and so on, consecutively.

The Corona Spectrum.

This is the final adopted list, as described above. It is almost impossible to estimate the intensity of these feeble lines by eye, so no attempt has been made to do so; but in the column headed "intensity" is placed the number of occurrences of the line in the two photographs, the maximum number being four, viz., on each side of both photographs.

Opposite each line in the table is placed the corresponding line that has been noted in previous eclipses. For a complete list of the observed corona spectrum, see Dr. Schuster's report on the eclipse of 1886 ('Phil. Trans.,' vol. 180 A, p. 335).

It will be observed that the 1474 K, or so-called corona line, is placed in the prominence and not in the corona spectrum. This line is shown very faintly on the extreme limit of one photograph, in which it certainly appears to belong to the prominence. It is true that it extends into the corona, but at the same time it also extends in the opposite direction, over the dark body of the moon. Its appearance is somewhat similar to that of the strong hydrogen lines, whose apparent extension into the corona spectrum is probably due to atmospheric haze.

This region of the spectrum has never been specially photographed with the slit spectroscope during an eclipse, and I think a serious attack on it should most certainly be made at the first opportunity, by using plates which can now be prepared, which are specially sensitive to this region of the spectrum.

Prominence Spectrum from Slit Spectroscope Photographs.

Intensity.	2-prism spectroscope.	1-prism spectroscope.	Reference.
1	3667·0		
1	3669·5		
1	3672·0		
1	3675·0		
1	3678·0		
4	3680·0	3680·0	
2	3682·0		
2	3687·0		
2	3692·5	3692·2	
3	3699·0	3699·0	Hξ
2	3700·0		
2	3701·0		
4	3707·5	3707·5	Hγ
3	3715·5	3715·1	
4	3716·9		
4	3718·0	3718·0	Hμ
1	3718·5		
1	3724·0		
1	3725·3		
4	3730·0	3730·0	Hλ
2	3732·8		
1	3737·3		
2	3741·3		
5	3745·5	3745·5	Hκ
3	3746·8		
5	3755·3	3755·0	
5	3757·4	3757·3	
1	3759·8		
1	3764·0		
5	3767·5	3767·5	Hι
5	3795·0	3795·0	Hθ
1	3813·5		
3	3817·7		
1	3822·5		
1	3823·6		
2	3827·5		
2	3828·5		
3	3830·8	3830·7	
5	3834·0	3834·0	Hη
5	3836·9	3836·5	
1	3839·6		
2	3855·8		
2	3858·8		
1	3866·5		
1	3877·1		
1	3880·5		
1	3882 8		
6	3888·0	3888·0	Hζ
1	3894·8		
1	3900·0		
1	3913·6		
6	3934·0	3934·0	K
1	3944·5		
1	3961·5		
6	3969·0	3969·0	Hϵ

Prominence Spectrum from Slit Spectroscope Photographs (*continued*).

Intensity.	2-prism spectroscope.	1-prism spectroscope.	Reference.
2	3986·9		
3	4026·6	4026·5	
1	4047·5		
3	4078·2	4078·4	Ca (Lockyer, 4078·2)
1	4092·5		
5	4101·2	4101·2	Hδ
3	4215·3	4215·3	Ca (Thalén, 4215·3)
1	4227·0	4226·5	Ca (Huggins, 4227; Thalén, 4226·3)
6	4340·0	4340·0	Hγ
4	4471·2	4471·2	*f*
6	4860·7	4860·7	Hβ
3	5015·0		
1	5169·1	..	b_3
1	5173·6	..	b_2
2	5184·2	..	b_1
1	5316·0	..	1474 K

Corona Spectrum from Slit Spectroscope Photographs.

Intensity.	2-prism spectroscope.	1-prism spectroscope.	Corresponding lines observed in previous eclipses.		
			1886.	1883.	1882.
2	3977·6	3977·0			
3	3982·6	3983·0			
2	3986·4	..	3986·0	3986	
2	3988·8				
1	3990·0	..	3990·0		
2	3992·5	3993·2	..	..	3992
2	3994·2	3995·0			
2	3998·8	3998·2	3998·4	3998	
3	4012·6	4011·9			
2	4015·6	4015·8	..	4016	4015
3	4022·0	4022·0			
2	4023·0	4023·8			
1	4031·6	..	4029·7	4031	
2	4039·3	4040·0	..	4037	
2	4054·0	4054·7	4054·8	4056	4057
2	4067·5	4067·8	4067·7	4064	4067
3	4070·5	4071·0	4071·0	4071	
2	4144·5	..	4144·2	4144	
2	4167·2	..	4166·0		
2	..	4169·0	4169·7	4169	4168
3	4175·0	4174·0	4173·6	..	4173
2	4181·2	4182·0	4183·5	4185	4179
4	4191·0	4190·3	4189·2	4192	4195
2	4202·1	4201·8			
2	..	4204·4	4203·5		

Corona Spectrum from Slit Spectroscope Photographs (*continued*).

Intensity.	2-prism spectroscope.	1-prism spectroscope.	Corresponding lines observed in previous eclipses.		
			1886.	1883.	1882.
2	4213·5	4212·2	4211·8	4213	4212
2	..	4224·4	4222·6	4227	4224
2	4267·5	4269·2	4268·5	..	4267
2	4279·7	4280·5	4280·6	4279	
2	4295·0	4295·3	4293·9	4291	
2	4299·5	4298·7	4301·0		
2	4328·3				
1	..	4331·5	4332·1	4330	
3	4353·0	4352·7	4354·7	4353	
3	4366·2	4364·9	4365·4	4363 (±3)	
4	4372·1	4372·4	4372·2	4370	4370
1	4378·5	..	4378·1	4377	
3	4386·7	4386·5	4387·6		
3	4389·5	4390·2	4389·0		
3	4395·2	4394·4	4395·8	..	4395
2	4447·5	..	4445·8	4449	
2	4454·7	4455·3	4452·9		
4	4465·4	4465·7	..	4465	
3	4468·8	4469·0	4468·5		
3	4494·0	4494·3	4493·4	4490	
3	4516·0	4516·3	4515·6	4518	
2	4530·2	4530·0	4530·0		
2	4536·0	..	4536·1		
2	4550·0	..	4550·0	4546	
1	4554·3	..	4557·2	4555 (±3)	
2	..	5020·0 (±2)			

VI. "The Stresses and Strains in Isotropic Elastic Solid Ellipsoids in Equilibrium under Bodily Forces derivable from a Potential of the Second Degree." By C. CHREE, M.A., Fellow of King's College, Cambridge, Superintendent of Kew Observatory. Communicated by Professor W. G. ADAMS, F.R.S. Received March 2, 1894.

(Abstract.)

If a system of bodily forces whose values per unit mass are derived from the potential

$$V = \tfrac{1}{2}(Px^2 + Qy^2 + Rz^2 + 2Syz + 2Tzx + 2Uxy)$$

acts on an ellipsoid

$$x^2/a^2 + y^2/b^2 + z^2/c^2 = 1,$$